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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

A Ponderosa Pine Needle Miner in the Colorado Front Range

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A population of Coleotechnites needle miners (Lepidoptera: Gelechiidae) caused noticeable defoliation to ponderosa pines in the Boulder area in 1971 and 1972. Although not assignable to it, this population exhibits life history and habits similar to those reported for C. pinella Busck, notably a 1-year life cycle and apparently markedly varied infestation rates between individual trees. Serious tree injury is not expected.

Keywords: Coleotechnites needle miners, Pinus ponderosa.

During midsummer 1971, Colorado State Forest Service foresters were asked to investigate a band of discolored ponderosa pines stretching along the foothills south of Boulder. The foresters first suspected a foliage disease, but a close look showed that most of the needles had been hollowed out from within by tiny moth larvae—needle miners.

The infestation attracted further attention in 1972, and was noted from Boulder as far south as Golden, in an altitudinally restricted belt of 200 to 300 feet centered at about the 6,200-foot contour level. I observed the infestation Southwest of Boulder near the National Center for Atmospheric Research (NCAR) on several occasions throughout the summer of 1972. This Note describes the main features of the moth's life history and habits, and the amount and kind of damage we expect it to cause.

Taxonomy

Adult moths were identified[2] as a species of Coleotechnites (Lepidoptera: Gelechiidae), a well-known genus of needle miners. Only two species, C. moreonella Heinrich and C. pinella Busck, have been described from ponderosa pine in Colorado (Freeman 1960). The current taxonomic status of the genus is such that the species we are dealing with cannot be precisely determined; it is not moreonella, and does not fit Busck's original description of pinella. However, biological notes presented in a short paper by Gillette (1922) on moths identified by Busck as pinella agree generally with my observations. More work will be needed before the taxonomic status of this and related species can be resolved.

Life Stages

Adult needle miners are tiny moths, with a wing span of about 10-12 mm. The forewings and abdomen of this species are mottled with black and white scales, giving the moths a generally gray appearance. The hind wings, heavily fringed behind, are silvery white.

Fully developed larvae are dark reddish brown with black head capsules, and measure about 8-10 mm. in length. Pupae are dark brown, about 5 mm. long. The eggs are initially yellow orange, nearly spherical, and about 0.5 mm. in diameter. They become more flattened as embryological development proceeds, and the larvae can eventually be seen inside.

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[2] *Moths identified by R. W. Hodges, U. S. National Museum, Washington, D. C.*

Life History and Habits

This ponderosa pine needle miner has one generation per year. Adult moths fly, mate, and lay eggs from late July through September (fig. 1). The moths are extremely quick, and run rapidly about the foliage. If disturbed, they fly readily.

Eggs are laid singly or (most often) in clusters up to 10 or 12, mainly in old mined-out needles, near the opening in the needle through which an adult moth has emerged. After the eggs hatch, in 6-8 weeks, the larvae move to green needles and bore in near the needle tips. They overwinter in these needles, probably feeding little, if any. Development resumes with the onset of warm weather, and larvae pupate within the mined needles around mid-July. Before the larva pupates, it provides for the emergence of the adult by cutting a round hole in the needle and furnishing a silk ramp to direct the adult out through the exit hole.

There is generally one larva per infested needle; each larva requires only one needle to satisfy nutritional requirements. About three-fourths of the needle — usually the central portion — is mined.

The limited observations made so far indicate that the moths prefer needles older than the current year's growth. Thus, the older needles bear the majority of the damage, leaving the new green foliage on the branch tips.

Individual branches from eight heavily infested trees bearing foliage produced from 1968-72 were examined on July 19, 1972. Since adults had not yet emerged, the current year's needles (1972) had no opportunity to become infested, and therefore were discarded. Degree of infestation of 1968-71 needles was as follows:

Year needles were produced	Needles examined	Percent infested
1971	620	13
1970	639	60
1969	484	74
1968	420	74

Presumably all these needles had been infested in summer 1971, because most mined-out needles fall in the autumn after adults have emerged.

There was also considerable variation in defoliation between individual trees: within the infested area, some trees were heavily infested, while adjacent ones were not. A similar situation was also mentioned by Gillette (1922). We do not presently have any explanation for this phenomenon, nor do we have data describing it more precisely. At NCAR in summer 1972, it was estimated that about one-third of the trees were infested enough to be considered severely defoliated.

Not all brown needles, even in the most heavily infested trees, were the result of needle miner activity. Some needles fade due to unknown causes, and natural needle drop throughout the year is normal in pines and accounts for some dead needles. Mined needles are readily separated from others by holding them up to the light. Mined needles are translucent, and if larvae or pupae are present, they can often be seen moving inside the needles.

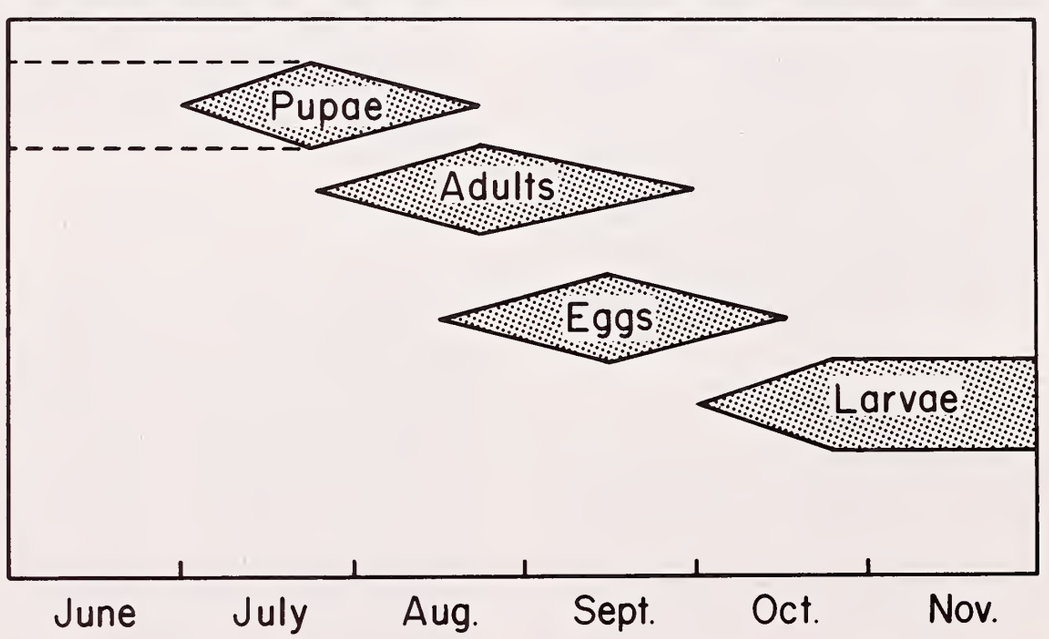

Figure 1.—Ponderosa pine needle miner life history, Boulder, Colorado, 1971-72.

Occurrence of Infestations and Their Expected Effects

While this is the first time within recent years that these needle miners have been studied carefully, conversations with foothill residents, along with unpublished forest insect survey reports, indicate that evidences of defoliation have been observed many times before. Occurrence seems to be sporadic, and the outbreaks short lived. W. F. Bailey, U.S. Forest Service, Denver, reports needle miner outbreaks both northwest and southwest of Colorado Springs in 1961, probably (but not definitely) of the present species. Needle miners have also been occasionally reported from ponderosa pine in the Durango area; these may also be the same species we are considering here.

The mechanisms by which insect populations rise and fall are complex interactions of physical and biological elements of the ecosystem. Many factors are involved. We have collected four species of hymenopterous (wasp) parasites from the needle miners, which undoubtedly have some influence in regulating needle miner numbers. There is evidence of other kinds of parasitic insects also. One would expect that temperature is an important factor; it may be responsible for the "band" effect, since the defoliation occurs in a clearly restricted elevational zone.

If we can establish that we are looking at the same species Gillette was, our records can be extended back nearly 70 years. Gillette (1922) indicated that defoliation was severe at Colorado Springs in 1905 and 1906, but between then and 1922 moths were "never . . . abundant enough to cause noticeable injury."

Defoliation by needle miners can be damaging; the lodgepole needle miner in California (Koerber and Struble 1971)[3] is a persistent and very destructive pest. In our situation, however, unless the present outbreak is more long lasting than previous ones, we would not expect any serious damage to the trees. To some observers the reddish cast given the trees may be considered objectionable from an esthetic standpoint; however, it can also be looked at as an interesting example of the "balance of nature," in which the trees are serving as hosts for the needle miners, and in which both the trees and the insects have been coexisting in the area for many generations.

[3]*Struble, George R. Biology, ecology, and control of the lodgepole needle miner. (In preparation as U.S. Dep. Agric. Tech. Bull. 1458.)*

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